Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
	)	

REPLY COMMENTS OF NOKIA

Nokia respectfully submits these Reply Comments in response to the Comments submitted regarding the Commission's Notice of Inquiry ("*NOI*") in the above-captioned proceeding.[1] Consistent with Nokia's initial Comments submitted to the Commission,[2] the record in this proceeding supports reallocation of the 3.7-4.2 GHz band to permit terrestrial broadband services. Clearing the band of Fixed Satellite Services ("FSS") services in the U.S. would unlock a full 500 MHz of mid-band spectrum for robust 5G operations. Nokia also supports building a record on other options to facilitate terrestrial broadband, such as mandated dynamic sharing of unused spectrum and market-based mechanisms.

With respect to the upper and lower 6 GHz bands, Nokia concurs with the wide-spread concerns that introduction of unlicensed services could cause harmful interference into incumbent services. We also agree that a variety of specific technical regulatory requirements should be considered, beyond mere Part 15 non-interference obligations, before allowing new services into the 6 GHz band.

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[1] *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz,* Notice of Inquiry, GN docket No. 17-183, FCC 17-104 (rel. Aug. 3, 2017) (*"NOI").*
[2] Comments of Nokia, GN docket No. 17-183, filed Oct. 2, 2017 ("Comments of Nokia").

I. THE COMMISSION SHOULD CONTINUE TO EXPLORE WAYS TO UNLOCK THE 3.7 GHZ BAND FOR 5G

A. The Record Indicates that Licensed FSS Use of the Band Is Limited

In Nokia's initial Comments in this proceeding, we documented a clear trend by satellite providers away from use of the 3.7-4.2 GHz band as demonstrated by the Commission's licensing database. Nokia further provided substantial evidence that the decline in licensed earth stations did not fully capture this consistent decline because a large number of those licensed stations (about 30 percent) does not exist.[3] Some of these earth stations may never have been built, were dismantled but left in the database, or – even worse – dismantled and then *renewed* despite no longer having underlying facilities.

Nokia further provided detailed concerns about the special treatment provided to earth stations -- the current practice of "full-band, full-arc" coordination. Full-band, full-arc affords FSS licensees the right to reserve a full 500 MHz of spectrum even if the licensee needs only a small fraction of that amount, in some cases only 23 MHz of the 500 MHz in use.[4]

Based on this picture of modest and declining use of the band by FSS, Nokia urged the Commission to clear the band of satellite earth stations, and place moratoria on new earth stations and on earth station renewals, unless the earth station applicant shows that C-band downlink is the only reasonable transmission path. Alternative transmission platforms like fiber could also be encouraged.

[3] Comments of Nokia at 6-8 (citing Broadband Access Coalition, Petition for Rulemaking, RM-11791 , at 23 (filed June 21, 2017) ("BAC Petition"); FWCC Letter to FCC, Request for Audit of Licensed Satellite Earth Stations in Bands Shared with the Terrestrial Fixed Service, at 3 (filed Sept. 30, 2016)).

[4] Comments of Nokia at 9 (citing BAC Petition at 22 and n.42).

B. Greater FSS Transparency and Reporting Will Demonstrate the Feasibility of More Intensive Use of the Band by Introducing Terrestrial Services

The record in this proceeding offers no rebuttal to the fact that licensed earth stations are in decline or that earth station licensees use only a fraction of band at any given time. Consistent with our earlier Comments, Nokia continues to believe that the Commission could extract the greatest value for the 3.7 GHz band by clearing the band of FSS uses, and reallocating the band for flexible use terrestrial services. As detailed in our Comments, Nokia views that coexistence of FSS and 5G systems on overlapping channels may not be practical, especially in urban and suburban areas, because of exclusion zones that may restrict 5G deployments in these prime areas for 5G.

We agree with commenters that suggest the Commission should examine the viability of transitioning some of the incumbent earth station use to fiber facilities.[5] Use of the band could be significantly reduced by encouraging that FSS earth station facilities be located outside of urban areas, with the content received by those earth stations transported via fiber to urban areas as needed.[6] The remaining rural sites could then be protected via exclusion zones as discussed by the American Cable Association (ACA).[7] Up-to-date information about FSS operations will help to more accurately calculate the size of these exclusion zones instead of assuming worst-case assumptions that could lead to very large exclusion zones around the FSS earth stations.

[5] Comments of Verizon, GN Docket No. 17-183, filed Oct. 2, 2017, at 18 ("Comments of Verizon"); Comments of T-Mobile USA, Inc., GN Docket No. 17-183, filed Oct. 2, 2017 at 14 ("Comments of T-Mobile").
[6] Comments of T-Mobile at 14.
[7] Comments of the American Cable Association, GN Docket No. 17-183, filed Oct. 2, 2017 ("Comments of ACA"), at 20.

The main rebuttal to evidence that FSS use is in decline are claims that there are large numbers of unregistered, receive-only earth stations not captured by the Commission's licensing systems and thus with no legal protections from interference under the current rules. ACA refers to this as "the phenomenon of significant under-registration of receive-only earth stations . . . ."[8] Nokia welcomes ACA's proposal to "resolve this problem" of non-registered earth stations and to "take steps to encourage" ACA's over 700 members to do so.[9] SES Americom, one of the two major satellite licensees in this band (the other being Intelsat), has similarly called for the Commission to "gather information regarding these earth stations in order to ensure that decisions regarding C-band spectrum are made based on a complete record."[10]

It is through complete information regarding all existing earth stations seeking continued use of the band, and transparency with respect to actual spectrum use by FSS, that the Commission will be able to best determine the path forward. The FCC has the opportunity to make the 3.7 GHz band a large mid-band 5G spectrum block, taking the lead in a globally harmonized 5G band. The benefits of that cannot be denied. Even FSS incumbents recognize the value of introducing new services in the band. ACA, for example, "welcomes more intensive use of the band."[11]

Also intriguing is the proposal posited jointly by Intelsat and Intel to introduce terrestrial broadband into the 3.7 GHz band through voluntary market mechanisms.[12] Assuming Intelsat is genuine in its proposal, its comment submission is clear evidence from an FSS

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[8] *Id.*
[9] *Id.*
[10] Letter from Karis Hastings, Counsel for SES Americom, Inc. to Marelene Dortch, Secretary, Federal Communications Commission, GN Docket No. 17-183, filed Oct. 30, 2017.
[11] Comments of ACA at 19.
[12] Joint Comments of Intelsat License LLC and Intel Corporations, GN Docket No. 17-183, filed Oct. 2, 2017 ("Comments of Intelsat-Intel").

incumbent that there are "frequencies that can be relinquished for terrestrial use in specific geographic areas,"[13] and that it could do so in as little as one year after a Report and Order.[14] Taken at their word, there is room for clearing in the 3.7-4.2 GHz Band. We agree with T-Mobile, which suggests "that the Commission use a variety of tools to accommodate existing users in the mid-band spectrum, including relocating those licensees to comparable facilities, with auction winners underwriting the costs of modifying incumbents' operations. This process has been used successfully in the past and can be used in the mid-bands."[15]

Nokia respectfully suggests that complete information is likely to show significant geographies and frequency ranges that are not in use. As discussed above, "full-band, full-arc" artificially blocks an entire 500 MHz when only a fraction of that may be in use. If up-to-date information of FSS operations is available, including the spectrum block being actually used by FSS at a given location, it is may be possible for 5G to use spectrum blocks adjacent to the one used by FSS. We therefore encourage the Commission to analyze how much of the spectrum is used by FSS at various locations and make that information available as part of this proceeding.

There are various tools available for spectrum sharing that could be used if the information indeed shows frequency ranges that are not in use by FSS within 3.7-4.2 GHz. For example, Intel and Intelsat suggest that FSS is using only portions of the spectrum band and that FSS could therefore be repacked to a certain part of the band leaving the rest for terrestrial 5G. Building on the Intel-Intelsat proposal,[16] if for instance FSS is using a total of 100 MHz at a

[13] *Id.* at 15.
[14] *Id.* at 18.
[15] Comments of T-Mobile 24.
[16] Comments of Intelsat-Intel at 15 ("Those FSS satellite operators, in turn, will work cooperatively to identify geographic areas of the country where they could undertake the complicated and costly process of clearing portions of the C-band for terrestrial use in defined areas by, for example, moving their services and customers to a portion of the 3700-4200 MHz band, physically moving ground antennas outside of identified geographic areas, or other means, as appropriate").

given location, that means that potentially 400 MHz is available for 5G at that location. Further, if this 100 MHz consists of non-contiguous smaller blocks, these blocks could be further repacked into a single 100 MHz block to the upper part of the 3.7-4.2 GHz band, leaving 400 MHz on the lower part of the band for 5G that is contiguous with 3.55-3.7 GHz band.

Other sharing approaches worth studying as part of this proceeding include "the type of protection provided for incumbent users in the 1695-1710 MHz band," as suggested by T-Mobile,[17] or an automated frequency coordination system similar to the one mentioned by the Broadband Access Coalition (BAC).[18] However, this band has the unique characteristics to become a major coverage and capacity band for 5G, and any sharing approach should include the introduction of mobile service and not just fixed services as proposed by the BAC. The change to an automated coordination systems is particularly relevant for the introduction of mobile services in the band and should be factored in from the beginning of this proceeding.

Nokia is skeptical whether the public interest would be served by making Intelsat a gate-keeper for this spectrum band, as proposed in the Intelsat-Intel proposal, when more fulsome information could show that a large portion of the band is simply unused. Clearing the band is also more likely to result in a rational band plan for terrestrial use, compared to the potential patchwork of available spectrum that could result from letting disparate existing satellite and earth station licensees enter into their own disparate deals. Despite this, Nokia will keep an open mind, and does not believe the Intelsat-Intel proposal should be dismissed out of hand. Nokia therefore, urges that the Commission continue to build a record in this proceeding, starting with obtaining complete information on current FSS use of the band.

[17] Comments of T-Mobile at 15.
[18] BAC Petition at 34-35.

The public interest would most certainly be better served by allowing hundreds of megahertz of fallow FSS spectrum to be used for terrestrial services. Again, Nokia advocates for clearing the band to the extent possible, to allow for the most robust terrestrial services to thrive. In the interim (or as an alternative, if the record demonstrates that clearing is not feasible in certain geographies), an appropriate sharing framework could achieve introduction of terrestrial services while addressing FSS operators' claimed need for flexibility.

II. THERE IS WIDESPREAD SKEPTICISM WHETHER NON-INTERFERING UNLICENSED OPERATIONS IN THE 6 GHZ BAND IS FEASIBLE

Unlike FSS in the 3.7-4.2 GHz band where there is ample evidence of spectrum being under-utilized, there is widespread agreement that incumbent fixed terrestrial use in the upper and lower 6 GHz band is intensive and growing. In its initial Comments, Nokia raised concerns whether any new services, including unlicensed operations, could be introduced into the lower or upper portions of the 6 GHz bands without causing harmful interference into incumbent terrestrial fixed services. Other parties voicing their concerns in this proceeding include public safety officials, public utilities, and telecommunications services providers.[19]

Nokia also urged in its Comments that mere reliance on legal requirements to not cause interference into incumbent services, set forth in Part 15 of the Commission's rules, would not be sufficient. Rigorous engineering analysis and testing to demonstrate a lack of harmful interference should be required before introducing a new unlicensed service into the band.

[19] *See, e.g.,* Comments of APCO International, GN Docket No. 17-183, filed Oct. 2, 2017, at iii ("Permitting flexible use of the 6 GHz bands for wireless broadband could be detrimental to public safety communications."); Comments of the Utilities Technology Council and the Edison Electric Institute, GN Docket No. 17-183, filed Oct. 2, 2017, at 6-12 (. . . any marginal benefit that might be gained by expanded use of the 6 GHz bands would be outweighed by the potential for interference to utility mission critical communications.); Comments of AT&T Services, Inc., GN Docket No. 17-183, filed Oct. 2, 2017, at 12-17 (". . . attempting to shoehorn unlicensed use into the 6 GHz band poses grave dangers.").

Nokia is pleased that proponents of unlicensed operations appear to agree that strict technical rules should be explored. For example, the Wi-Fi Alliance recognizes that "transmit power limits, antenna gain masks, and other operational constraints can be adopted for Wi-Fi operations" in the upper and lower portions of the 6 GHz band.[20] Hewlett Packard Enterprise also recognizes, "[EIRP] limits, antenna-pointing limits, restrictions on outdoor operation, antenna-height limits, a requirement to transmit identifying information, and even database requirements. . . ." should be considered.[21] All of these, and potentially other mitigation techniques, should be explored and potentially adopted in the context of rigorous engineering analysis before new services in the 6 GHz band should be allowed.

III. CONCLUSION

Nokia appreciates the Commission's consideration and respectfully requests that the Commission proceed promptly to a Notice of Proposed Rulemaking, consistent with the recommendations set forth in these Reply Comments and Nokia's initial Comments in this proceeding.

Respectfully submitted,

Nokia

/Brian Hendricks/

Brian Hendricks
Jeffrey Marks
Government Relations

Nokia
1100 New York Avenue, NW
Suite 705 West
Washington, DC 20005

Prakash Moorut
Bell Labs

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[20] Comments of Wi-Fi Alliance, GN Docket No. 17-183, filed Oct. 2, 2017, at 7.
[21] Comments of Hewlett Packard Enterprise Company, GN Docket No. 17-183, filed Oct. 2, 2017, at 12.